JAQUET
TECHNOLOGY GROUP

Content

Software & System Safety of the FT 3000 – IEC 61508 Certification

JAQUET and the FT 3000 have been audited and certified to IEC 61508 SIL 3.
IEC 61508 is the reference standard for new installations.

IEC 61508 is a seven part international standard for Programmable Electronic Systems used in safety-related situations. The full title is, "Functional safety of Electrical / Electronic / Programmable Electronic Safety-related systems" (E/E/PE or E/E/PES). IEC 61508 covers manufacturing and supplying devices to be certified for use in safety instrumented systems (SIS).

The standard is generic, and applies to safety-related control systems, PLC's, devices and components (including sensors, actuators and the operator interface). The main areas covered by the standard are:

- measures and techniques for avoidance and control of faults during design and development of hardware, operating system software and application software
- hardware fault tolerance of systems / subsystems (including "safe failure fraction" and diagnostic coverage)
- probability of "failure to danger" of the subsystem (reliability modeling techniques)

The approach taken in IEC 61508 is:

- to identify all the hazards that have been left for the safety-related system(s) to address
- to identify hazardous events and the event sequences that lead to them
- to specify the safety functions necessary to achieve a safe state for each hazardous event
- to specify the safety integrity requirements as a performance measure for each safety function, based on the necessary risk reduction for the relevant hazardous event and event sequence
- to allocate safety functions to the safety-related system(s).

The safety integrity level of the safety function determines the requirements of IEC 61508 to be met and hence the extent to which risk is reduced. Safety integrity is a measure of risk reduction (in terms of probability of failure to perform a safety function), not just a measure of reliability.

The FT 3000 probability of dangerous failure per hour on high demand (continuous operation) is 2.209e-8 which equates to 1 dangerous failure in 5461 years. Dangerous failure is a failure to perform the safety function as defined and covers failure to trip and spurious trip.

Where the critical over speed function is concerned, the architecture is as follows:

Each machine will be protected using 3 separate monitoring channels. Each channel is equipped with 3 speed monitors that are based on hardware re-triggerable One Shot circuits. These are set with every positive edge of the input frequency. The timebases are derived from 3 down counters that are set with the set point frequency and clocked down using a 2.5MHz reference signal. If the counter reaches zero before the arrival of the next positive edge, this indicates that the input frequency is lower than the set point. These functions for one limit value are performed in an ASIC (Application Specific IC).

The preset values for the down counter are stored in EEPROM and loaded into the ASIC. The preset (limit / trip) values are not lost if the power should fail. The 3 speed monitors continuously collect speed frequency data without interruption.

For the purposes of system redundancy, all 3 monitors may be used. One from each channel to provide the 2oo3 control of the machine trip relay, one from each channel to signal to Management Systems and one from each channel held in reserve.
The associated relay and LED display functionality can be defined as latching or non-latching. It is proposed that the 2oo3 trip relays and associated displays are non-latching but that the other two 2oo3 functions are latching. Current and passed over speed status is thereby provided.
Please consult JAQUET for applications requiring SIL 4.

ZERTIFIKAT • CERTIFICATE • 認証証書 • СЕРТИФИКАТ • CERTIFICADO • CERTIFICAT

CERTIFICATE

No. Q4B 04 12 54838 001

Holder of Certificate: **Development Department of Jaquet Technology Group**
Thannerstrasse 15
4009 Basel
SWITZERLAND

Factory(ies): Development Department of Jaquet Technology Group
Thannerstrasse 15, 4009 Basel, SWITZERLAND

Certification Mark:

Scope of Certificate: **The development process of the safety related electronic system compact speed control and overspeed protection system FT 3000 up to SIL 3, including the FT 3100, FT 3200, FT 3300**

Applied Standard(s): IEC 61508-1-4:1998

The Certification Body of TÜV Product Service GmbH certifies that the company mentioned above has established and is maintaining a management system which meets the requirements of the listed standards. The results are documented in a report. See also notes overleaf.

Report No.: JB 64501 A

Valid until: 2007-12-13

Date, 2004-12-13

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TÜV PRODUCT SERVICE GMBH • Zertifizierstelle • Ridlerstrasse 65 • D-80339 München
Gruppe TÜV Süddeutschland

JAQUET Statement on API 670

The American Petroleum Institute (API) generates minimum requirement standards to address problems of a general nature. API 670 describes the basic requirements for over speed protection systems.

The FT 3000 is API 670 compliant whilst providing greater functionality than competitive products that have been designed to meet the absolute minimum specification requirements.

With a PC attached, the FT 3000 more than meets the requirements of a non integral display system. The addition of an analogue card with 2 indicators meets the requirements for a local or alternatively remote display of speed and peak speed. It is then a cost consideration as to whether the customer really needs a local display and how this is provided.

More importantly, the FT 3000 is also fully compliant with and certified to the higher level IEC 61508 international standard.

Arguments in favour of the FT 3000 when compared with API 670

Separate over speed and speed measurement functionality.

Acceleration function offers pre warning of pending over speed condition thus providing an opportunity to save time in the total shutdown sequence. (shutdown valves can take circa 160ms to close)
Response to absolute over speed typically 10ms.

Higher level of status and fault signalling e.g. individual 1oo1, 1oo3 per function and channel.

1, 2 or 3 independent speed monitors per channel for over speed detection redundancy.

Over speed alarm and shutdown facilities via separate monitors and relays.

Under speed signalling facility, e.g. to start barring gear or control oil pumps.

Optional analogue outputs provide the facility for large remote displays.

Function ABC available. Very useful together with instantaneous displays of the 3 channel measured values to highlight gear machining errors.

Configurable number of pulses for over speed detection. Essential requirement for compromise between minimum reaction time and the need to accommodate gear machining errors.

Test on status output available.

Test interlock possibility.

2 shafts can be protected in one rack.

Type Approval Certificate

Germanischer Lloyd

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	42 768 - 02 HH
Company	JAQUET AG Thannerstrasse 15 CH-4009 Basel
Product Description	Frequency Measurement and Switching Instruments
Type	FTW 1413 (Frequency/current converter) FTFW 1422, FTFW 1424 (Combined tachometr converter/frequency relay)
Environmental Category	C
Technical Data / Range of Application	Power supply : 93... 264 V AC or 93 ... 375 V DC 15 ... 58 V AC, 18... 60 V DC
	Range: 0 ... 0,999 Hz - 0 ... 50,00 kHz programmable
	Output: 0/4 ... 20 mA / 0/2... 10 V Maximum load: 500 Ohm 1 switch over contact max 250 V, 1A, 50 W (FTFW 1422) 2 switch over contacts max 250 V, 1A, 50 W (FTFW 1424)
	Resolution: 12 Bit = 0,1%
	Accuracy class: 0.2%
	Incorporated sensor power supply +12 VDC, 25mA
Test Standard	Regulations for the Performance of Type Tests, Edition 2001
Documents	Test report No. 376D-73034 dated 22.03.2002 Operating Instructions Part-No. 376A-63515 dated 20.04.1994 Software Questionnaire Requirements class 3 dated 18.02.2002
Remarks	None
Valid until	2007-04-18

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Type Approval Symbol GL

File No. I.D.07

Hamburg, 2002-04-19

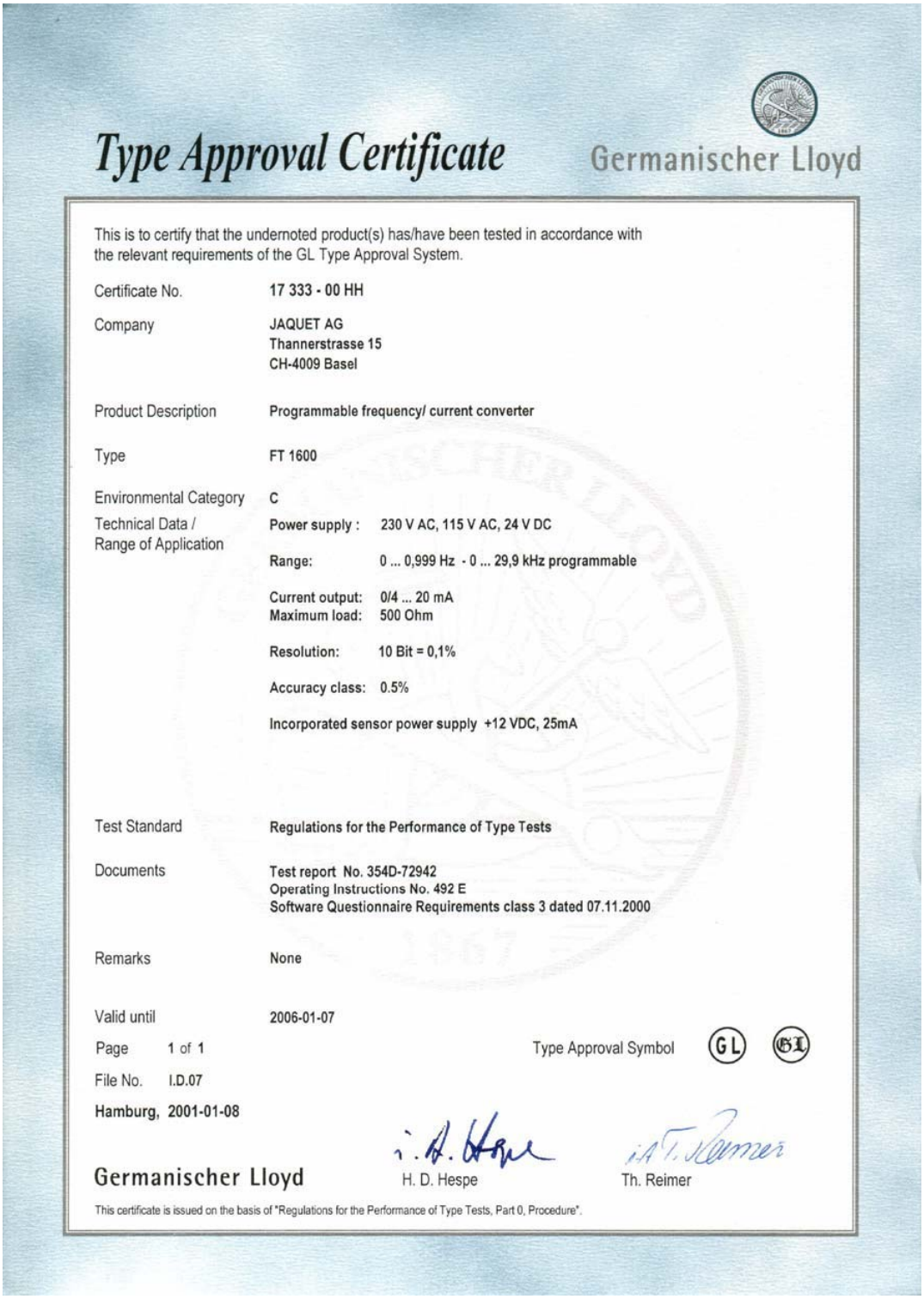
i.V. W. Voß

Germanischer Lloyd W. Voß

i.A. Th. Reimer

This certificate is issued on the basis of "Regulations for the Performance of Type Tests, Part 0, Procedure".

GL Certificate FT1600



Type Approval Certificate

Germanischer Lloyd

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	17 333 - 00 HH
Company	JAQUET AG Thannerstrasse 15 CH-4009 Basel
Product Description	Programmable frequency/ current converter
Type	FT 1600
Environmental Category	C
Technical Data / Range of Application	Power supply : 230 V AC, 115 V AC, 24 V DC Range: 0 ... 0,999 Hz - 0 ... 29,9 kHz programmable Current output: 0/4 ... 20 mA Maximum load: 500 Ohm Resolution: 10 Bit = 0,1% Accuracy class: 0.5% Incorporated sensor power supply +12 VDC, 25mA
Test Standard	Regulations for the Performance of Type Tests
Documents	Test report No. 354D-72942 Operating Instructions No. 492 E Software Questionnaire Requirements class 3 dated 07.11.2000
Remarks	None
Valid until	2006-01-07

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File No. I.D.07

Type Approval Symbol GL

Hamburg, 2001-01-08

Germanischer Lloyd

i.A. H. Hespe

i.A. Th. Reimer

This certificate is issued on the basis of "Regulations for the Performance of Type Tests, Part 0, Procedure".

Type Approval Certificate

Germanischer Lloyd

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	43 193 - 02 HH
Company	JAQUET AG Thannerstrasse 15 CH-4009 Basel
Product Description	Universal Digital Tachometer with 2 frequency inputs
Type	DFP 951... ... DFP 952 ... ...
Environmental Category	C
Technical Data / Range of Application	Power supply : 93... 264 V AC /130 ... 375 V DC (... UC2 ...) 15 ... 58 V AC, 18... 60 V DC (... UC3 ...) 9 ... 18 V DC (... DC0 ...) Range: 0 ... 0,1 Hz - 50 kHz Sensors: magnetic, Ferrostat , HF transmitters, proximity switches according to DIN 19234 Output: 0 ... 20 mA, Maximum load: 500 Ohm (... ... I) Serial interface EIA RS 232 C (... ... D5) 2 relay contacts max 220 V, 1A, 50 W (... ... R) Accuracy class: 0.004% + 1 digit Incorporated sensor power supply: +12 VDC, 120 mA Degree of protection: front IP 54, terminals IP 20
Test Standard	Regulations for the Performance of Type Tests, Edition 2001
Documents	Test report No. 3645D-73077 dated 09.08.2002 Operation instruction No. 482 Software Questionnaire Requirements class 3 dated 02.08.2002
Remarks	None
Valid until	2007-08-18

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Type Approval Symbol GL

File No. I.D.07

Hamburg, 2002-08-19

i.V. W. Voß

i.A. Th. Reimer

Germanischer Lloyd W. Voß Th. Reimer

This certificate is issued on the basis of "Regulations for the Performance of Type Tests, Part 0, Procedure".